LESSON 4: What Is Composting and Why Is It Important?

Note: This lesson focuses on indoor composting without using worms. If you are interested in outdoor composting, see the "Resources" section in this lesson and "Appendix D, Setting Up and Maintaining Composting Systems." If you want your students to learn how to vermicompost (compost with worms), see the K–3 Module, Unit 3, Lesson 1 and "Appendix D–II, Maintaining a Vermicomposting System."

LESSON'S CONCEPTS

- Composting is a way of recycling organic matter that might otherwise be sent to a landfill.
- Composting reduces the volume of organic waste and saves landfill space; the compost can be used to improve a soil's structure and fertility.

PURPOSE

Students will be introduced to the basics of composting.

OVERVIEW

In this lesson students will:

- Conduct experiments to identify the five essential components in the production of compost.
- Identify materials that can be composted and those that should not be composted.
- Classify materials that are considered green organic matter and brown organic matter to use in a compost pile.
- Use 2-liter beverage containers to simulate the conditions of a landfill and of a compost pile and compare the decomposition rates of organic materials in both containers.
- Connect the action of composting to reducing the amount of waste that is sent to a landfill.
- Apply what they have learned by writing about composting.

CORRELATIONS TO CALIFORNIA'S CONTENT STANDARDS

- Students write a prediction and design an experiment to compare the kinds of ingredients necessary for composting to occur.
  - "Scientific progress is made by asking meaningful questions and conducting careful investigations. As a basis for understanding this concept . . . students will: . . . formulate predictions and justify predictions based on cause and effect relationships." (*Science Content Standards, Grades K–12*; Grade 4; Investigation and Experimentation, Standard 6c)
  - "Students will: . . . identify a single independent variable in a scientific investigation and explain what will be learned by collecting data on this variable." (*Science Content Standards, Grades K–12*; Grade 5; Investigation and Experimentation, Standard 6e)
- Students simulate the conditions of a landfill and of a compost pile in two-liter bottles in order to compare the decomposition rates of organic matter in both bottles. They compare the contents of both bottles and describe their findings in writing.
  - "Students will: . . . develop a testable question." (*Science Content Standards, Grades K–12*; Grade 5; Investigation and Experimentation, Standard 6b)
  - Students "write research reports about important ideas, issues, or events by using the following guidelines: (a) frame questions that direct the investigation; (b) establish a controlling idea or topic; and (c) develop the topic with simple facts, details, examples, and explanations." *(English–Language Arts Content Standards for California Public*

Schools, Kindergarten Through Grade Twelve, page 31)

- Students write a poem or description about compost.
  - Students "choose the form of writing (e.g., personal letter, letter to the editor, review, poem, report, narrative) that best suits the intended purpose." *(English–Language Arts Content Standards for California Public Schools, Kindergarten Through Grade Twelve*, page 37)

TIME

20–30 minutes to prepare for the lesson; 45–60 minutes for each part to set up the experiments (Additional time will be needed several weeks later to observe the results.)

VOCABULARY

aerobic, anaerobic, compost, composting,

PREPARATION

___ **1.** Read the "Background Information for the Teacher" at the end of this lesson.

___ **2.** Obtain a box and write the words "Compost Recipe" on it. Write and/or draw each of the five components on an 8½ by 11-inch sheet of paper:

- Decomposers in soil
- Green organic waste
- Brown organic waste
- Water
- Air

___ **3.** Make a transparency of "Materials to Compost and Not to Compost" (page 489).

MATERIALS

For "Pre-Activity Questions"

___ A box with the words "Compost Recipe" written on it, containing a sheet of paper for each of the five key compost ingredients (decomposers, green organic waste, brown organic waste, water, and air)

For "Part I, Experimenting with Different Conditions and Ingredients for Composting"

___ Transparency of "Materials to Compost and Not to Compost"
___ A banana peel
___ Several leaves (The leaves from Lesson 1 could be used.)
___ A handful of finished compost (As a substitute, potting soil or commercial compost can be purchased at a garden supply store.)
___ 12 cups of dried leaves and/or shredded paper
___ 12 cups of vegetable and fruit parts (cut into small pieces and mixed together to provide the same ingredients for each container) or grass clippings with or without the vegetable and fruit parts
___ 2½ cups of garden soil (not sterilized potting soil)
___ Approximately 3 cups of water
___ Six 1-gallon containers (These can be large mayonnaise jars, 1-gallon milk jugs, or 1- gallon water containers, but they should all be the same type of containers, and all of them should have lids. One-gallon milk or water containers should have the top 2 inches cut most of the way around, leaving a hinged top.)
___ Weight scale
___ Measuring cup
___ Stirring spoon
___ Plastic or rubber gloves, one for each group of students
___ Several sheets of newspaper for each gallon container on which to dump contents for observation

For "Part II, Comparing a Landfill to a Compost Pile"

___ The video *Kids Talking Trash* (available from the California Integrated Waste Management Board) or *The Rotten Truth* (See "Resources.")
___ Two 2-liter plastic beverage containers for each group (or other beverage containers; e.g., 1-quart water bottles)
___ Masking tape and marker
___ Organic yard and food waste (leaves, grass clippings, wood ash, sawdust, shredded paper, eggshells, fruit and vegetable food waste)
___ Garden soil or nonsterile potting soil
___ Other materials requested by students
___ Water in a spray bottle
___ Plastic or rubber gloves for each group of students

PRE-ACTIVITY QUESTIONS

A. Ask students what they know about composting and what they would like to know. Make a chart and list the students' responses on the chart.

B. Ask students what we would need if we wanted to make organic material decompose. (They should incorporate what they learned in lessons 1, 2, and 3.)

- List on the chalkboard what the students say.
- Bring out the box with "Compost Recipe" written on it. Inside, have a sheet of paper for each of the five key ingredients to make compost. Pull them out one at a time as you introduce them.
- Compare these with the list on the chalkboard; correct the list as needed.

C. Have students think about the experiment they completed in Lesson 1 on the decomposition of leaves or in Lesson 3 on the decomposition of organic materials and ask them to relate it to the "Compost Recipe." Ask students what they think finished compost would look like.

PROCEDURE

Part I, Experimenting with Different Conditions and Ingredients for Composting

A. Using the class chart on organic and inorganic materials started in Lesson 3, "Part I," brainstorm with the class additional organic materials (those that could be composted) and list these on the chart. Then brainstorm a list of inorganic materials and list these on the chart. Have the class select from the chart what they would like to compost and what they would not want to compost.

B. Show the transparency, "Materials to Compost and Not to Compost," and compare it to the class chart. Add to the class chart. Then have students determine what is considered brown organic material and what is considered green organic material, as listed on the transparency. (The first eight items are "browns" and the last two items are "greens.")

C. Show a banana peel, several leaves, and the finished compost (potting soil can be used as a substitute). Allow students to touch the compost. Ask them how we convert a banana peel and leaves to compost. Review with the students the five components needed to make compost: *Decomposers, green organic waste, brown organic waste, water, and air.*

Students in Joanne Williams's sixth-grade class at Las Palmas Elementary School brainstorm what they know and what they would like to know about composting.

D. Have students hypothesize what they think will happen if any one of the five conditions for composting is missing. Ask students to write their predictions in their journals. Ask them to design an experiment to determine what the ideal conditions are for composting. One way to set up for this experiment is described below. Note that the control in this experiment is "Container 6," which has all five essential ingredients. Each of the other containers has one different variable removed, and these will be compared by visual examination of the decomposition rate and effectiveness of the decomposition to "Container 6." (Another way to do this is to dry and weigh the organic material before placing it in the various containers. Then at the end of the experiment, dry and weigh the remaining organic material and compare these figures to the original weights. The differences in weight is the amount decomposed.)

E. Students can set up six compost containers containing different ingredients and compare the results in four to six weeks**.** Have students hypothesize in which containers the most amount of compost will be created

and in which containers the least amount of compost will be created and to offer their reasons. Ask students to write their predictions in their journals.

1. Each container should have equal amounts of the various components, except for the one ingredient that is not included. (Container 6 will have all of the ingredients. Also, Container 3 will have double the amount of dried leaves, and Container 4 will have double the amount of vegetable and fruit parts or grass clippings to keep the amount of organic materials the same.) One way to determine equal amounts of various components is to weigh all the dry materials; or a measuring cup can be used to measure the volume of the dry materials. Use a measuring cup to measure the amount of water added to each container (except for Container 1).
   - Container 1—**Not enough moisture**: Add 2 cups of dried leaves (brown organic waste), 2 cups of vegetable and fruit parts or grass clippings (green organic waste), and ½ cup of garden soil. Mix every two to three days to add oxygen. Do not add water. Keep the lid resting on the container, but not tightly; or poke holes in the lid.
   - Container 2—**Not enough air**: Add 2 cups of dried leaves, 2 cups of vegetable and fruit parts or grass clippings, ½ cup of garden soil, and ¼ to ½ cup of water (enough to moisten). Compress the contents to push out the air. Do not stir and keep the lid on tightly.
   - Container 3—**Not enough green organic waste**: Add 4 cups of dried leaves, ½ cup of garden soil, and ¼ to ½ cup of water (enough to moisten). Mix every two to three days to add oxygen. Do not add parts of vegetable and fruit or grass clippings. Keep the lid resting on the container, but not tightly; or poke holes in the lid.
   - Container 4—**Not enough brown organic waste**: Add 4 cups of vegetable and fruit parts or grass clippings, ½ cup of garden soil, and ¼ to ½ cup of water (enough to moisten). Mix every two to three days to add oxygen. Do not add dried leaves. Keep the lid resting on the container, but not tightly; or poke holes in the lid.
   - Container 5—**Not enough microorganisms**: Add 2 cups of dried leaves (rinse these in soapy water first to wash off some decomposers), 2 cups of vegetable and fruit parts or grass clippings, and ¼ to ½ cup of water (enough to moisten). Mix every two to three days to add oxygen. Do not add soil. Note that dried leaves will contain some decomposers. Keep the lid resting on the container, but not tightly; or poke holes in the lid. (Another way to do this is to sterilize the soil and the organic waste by microwaving them for several minutes.)
   - Container 6—**Has all five essential ingredients**: Add 2 cups of dried leaves, 2 cups of vegetable and fruit parts or grass clippings, ½ cup of garden soil, and ¼ to ½ cup of water (enough to moisten). Mix every two to three days to add oxygen. Keep the lid resting on the container, but not tightly; or poke holes in the lid.

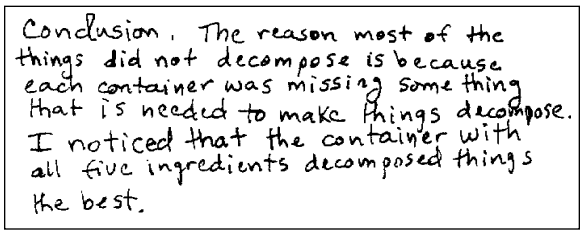
Note: Make certain that you use garden soil, not sterilized potting soil. Also, for all containers in which ingredients need to be mixed, make certain that they are mixed at the same time in the same manner. If the lid is off completely, the compost could dry out too fast.

2. After approximately four weeks, have students examine the contents of the six containers and compare the rates and effectiveness of decomposition among the containers. Provide plastic gloves and have students:
   - Dump the contents on several sheets of newspaper.
   - Compare the color, odor, texture (feel), and the amount of decomposition in each container.
   - Create a chart of results.

- Compare their results to their predictions.
- Discuss what the results mean.

F. Ask students to write in their journals a conclusion to the experiment.

G. Ask students what they could do with the finished compost. Lead students to conclude that the finished compost is a natural fertilizer that could be used to enhance the soil in gardens and flower pots.


Conclusion. The reason most of the things did not decompose is because each container was missing some thing that is needed to make things decompose. I noticed that the container with all five ingredients decomposed things the best.

Submitted by Janet Cohen, sixth-grade teacher, Gold Trail Elementary School, Gold Trail Union School District.

Part II, Comparing a Landfill to a Compost Pile

A. Watch the first part of the video, *Kids Talking Trash,* or the entire video, *The Rotten Truth*. Discuss the video and, as needed, provide explanations to students concerning why things do not decompose rapidly in a landfill. Items buried in a landfill decompose slowly because the conditions are not ideal for rapid decomposition by decomposers, many of which need oxygen and moisture. Note that some decomposers, such as anaerobic (those that do not need oxygen) bacteria also decompose garbage in a landfill. But most landfills are not exposed to air, because the garbage is covered with soil to keep it from smelling and attracting animals (e.g., mice and rats). As a result, organic wastes buried in landfills may take decades to decompose.

B. Tell students that they will work in groups and use two 2-liter plastic beverage containers to compare a landfill to a compost pile. Ask them to develop a question they can answer about landfills and compost piles.

C. Once a group has written a satisfactory question, provide two 2-liter plastic beverage containers to the group.

1. Ask students to use masking tape and a marker to label one "Bottle A" and one "Bottle B" and to write their names on a piece of tape affixed to both bottles.

- In "Bottle A" they will simulate the conditions in a landfill: no air and no water.
- In "Bottle B" they will simulate the conditions in a compost pile with air and water.

2. Allow students to determine how they will set up each bottle. For each bottle, each group should:

- Make a prediction as to how much will decompose.
- Come up with a plan on how each bottle will be set up.
- Draw the layers.
- Describe the ingredients they plan to add.

They should have similar materials in each bottle to compare their decomposition. However, the "A" bottles (landfill) should not have oxygen, water, or be exposed to sunlight. Tell students that in a landfill, soil is used to cover trash at the end of the day. Therefore, all "A" bottles will need to have a layer of soil on top. Students should make certain the contents are stirred in "B" bottles on a regular basis to add oxygen to the system. Also, students should keep the contents of the "B" bottles slightly damp. They might need to use a spray bottle to add moisture.

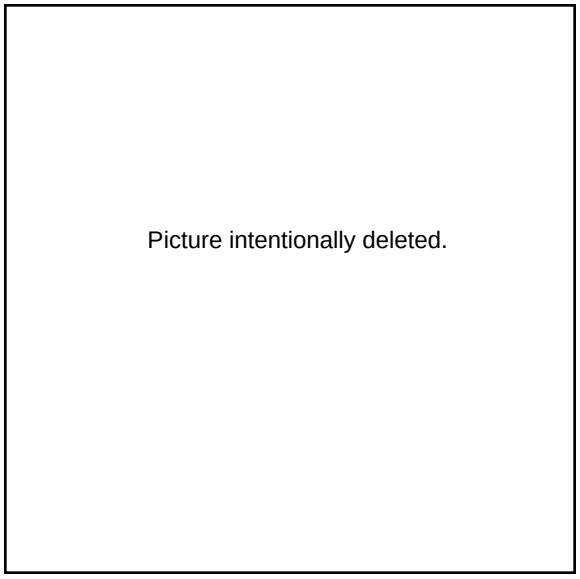
3. Help students acquire the materials to set up their experiments. Students should record all of the materials that they placed in their bottles.

C. After approximately three to four weeks, have students dump the contents of each bottle on a separate piece of newspaper and compare the contents.

- Ask students to write a comparison between the contents of both bottles.
- Was there more decomposition happening in "Bottle B" than in "Bottle A"? Ask students to explain their answers.

DISCUSSION/QUESTIONS

- What is composting and how is it related to recycling? *Composting is a form of recycling in which organic material is decomposed by decomposers.*



Students from Janet Cohen's sixth-grade class at Gold Trail Elementary School add water to the "B" bottle simulating moist conditions in a compost pile.

- What are the benefits of composting? *Composting reduces the volume of waste sent to landfills and recycles nutrients and other components necessary for plants to grow.*

At the end of the experiments (questions for younger students)

Ask students:

- What happens to the food waste and yard clippings put in a compost pile? *They become compost.*
- How do they change*? Decomposers decompose the food waste and yard clippings.*
- Where would the food and yard clippings have gone if they were not composted? *They would have been sent to a landfill.*

At the end of the experiments (questions for older students)

Ask students:

- What are the components necessary in a compost pile? *Decomposers, green organic waste, brown organic waste, water, and air.*
- What did the "control" container in the composting experiment reveal? *When all five ingredients are present, organic materials decompose faster.*
- What types of materials should be and should not be composted? (See "Materials to Compost and Not to Compost.") Why? *Decomposers can decompose organic materials but not inorganic materials.*
- Based on the experiments conducted in Lesson 3 and what you learned in this lesson, which packaging material can be composted? *Paper bags, paper egg cartons, cereal boxes, apple and potato peelings, banana peels.*

APPLICATION

A. In Lesson 3, "Application," students wrote in their journals how nature eliminates wastes or how humans can use nature's model. Ask students to expand on their narratives in their journals concerning ways people can do this. Discuss their responses.

B. Ask students to select one of the following to do individually or in groups:

1. Brainstorm a list of words that describe compost and/or decomposition. Write a poem about compost, composting, or decomposition.

- One idea is to create a cinquain. This type of poem is made up of five lines.
  - The first line: two syllables, a title.
  - The second line: four syllables, describing the title.
  - The third line: six syllables, expressing an action.
  - The fourth line: eight syllables, expressing a feeling.
  - The fifth line: two syllables, a synonym for the title.

For example:

Compost

Dark, moist, moldy,
Decomposing dead stuff
Enriching and enhancing soil,
Humus.

- Another idea is to write an acrostic in which each letter in a word is used to start another word. The example on the next page was written by Natasha Stillman, Cara Morgan, and Olga Clymire.

Decomposition

Decay
Earthworms
Carbon
Organisms
Mold
Peels from fruit and vegetables
Organic materials
Scavengers
Insects
Trash that's compostable
In the soil
Old egg shells, coffee grounds, and bread
Nitrogen

2. Write about the following: If your trash can no longer be picked up and you had to keep your garbage, what would you do? For example, bury food scraps in the compost pile; recycle cans, bottles, paper.
3. Write a paragraph explaining the composting process.

Project Idea: Have students conduct research on what type of composting activities could work at school. They should also consider vermicomposting. Have students plan and implement a composting program.

EXTENSIONS

A. Have students investigate how a material's size affects the rate and effectiveness of decomposition. Students can prepare one compost pile containing large pieces of organic waste and another containing small pieces of the same types of organic waste, or students can cut up fruit into different sizes to test whether smaller pieces decompose faster than larger ones. (The smaller pieces should decompose faster because there is more surface area for the decomposers to attack.)

B. Read to students *Pee Wee and the Magical Compost Heap* by Larraine Roulston. This can be read as guided imagery where students travel into a compost pile.

C. Invite a speaker who composts to talk to your class. (For sources of speakers, check with your city's or county's waste manager or recycling coordinator.)

D. Take your class to see compost bins at a local community garden and have a gardener explain how they work.

E. If your community has a municipal composting center, take a field trip to observe its operation.

F. Collect samples of natural humus from a wooded area. Have students examine the humus for evidence of decomposers (e.g., fungi) and scavengers (e.g., sow bugs, red worms, and insects). Ask students to observe and compare the texture, odor, and color of natural humus to prepared compost.

G. Take students to a local landfill to see what becomes of food and yard waste placed in a landfill. Before the trip, ask students what they predict happens to such waste when it is buried in landfills. If a field trip is not possible, invite a local waste management representative to speak to your class.

Ask the waste management representative during the presentation to explain to students why organic material does not decompose rapidly in a landfill. Also, ask the representative to explain why methane gas, a natural product of the decomposition process by anaerobic bacteria, is present in a landfill.

H. Have students determine the quantity and type of food scraps discarded by the school (school-generated food scraps) and to come up with a plan to decrease the amount of food that is taken to a landfill.

I. List problems of composting and have groups of students figure out how to solve them. For example, suggest a way to help or encourage students to sort compostable materials in the cafeteria.

RESOURCES

Videos

Kids Talking Trash. San Leandro, Calif.: Alameda County Waste Management Authority, 1995 (14 minutes). Distributed by the California Integrated Waste Management Board.

Shows a landfill. Students learn how to make less garbage and protect the environment by practicing the four R's: reduce, reuse, recycle, rot.

Reuse. Protecting Our Environment series. Chatsworth, Calif.: AIMS MultiMedia, 1991 (13 minutes).

Shows how yard trimmings and kitchen scraps can be made into compost.

The Rotten Truth. Pleasantville, N.Y.: Sunburst Communications, 1991 (30 minutes).

Shows the world's largest landfill. Describes how to compost.

Taking Care of Your Own Composting for the 90s. Sacramento: California Integrated Waste Management Board, 1992 (23 minutes).

Describes how to compost at home.

Books

Campbell, Stu. *Let It Rot! The Gardener's Guide to Composting*. Pownal, Vt.: Storey Communications, Inc., 1990.

Provides background information on composting and explains various ways to compost.

Harmonious Technologies. *Backyard Composting: Your Complete Guide to Recycling Yard Clippings*. Ojai, Calif.: Harmonious Press, 1992.

A step-by-step guide on how to compost.

Kalman, Bobbie, and Janine Schaub. *Buried in Garbage*. New York: Crabtree Publishing Company, 1991.

Contains information on composting.

Martin, Deborah L., and Grace Gershuny, ed. *The Rodale Book of Composting; Easy Methods for Every Gardener*. Emmaus, Penn.: Rodale Press, 1992.

A comprehensive book about composting. Includes information on the benefits of composting, life inside a compost heap, methods and use of composting, and large-scale composting.

Roulston, Larraine. *Pee Wee and the Magical Compost Heap.* Toronto, Ontario: Recycling Council of Ontario, 1992.

A fantasy trip into a compost pile by children who shrink in size.

Activity Guides

Compost Module: Composting Activities for Children. British Columbia: BC Environment, 1995.

Contains a variety of activities on composting. Students find out how much garbage they produce, what it consists of, and how to reduce, reuse, and recycle through composting.

Composting Across the Curriculum. A Teacher's Guide to Composting. San Rafael, Calif.: Marin County Office of Waste Management, 1993.

Contains a variety of activities on composting. Includes topics, such as how to connect composting to a teacher's curriculum, how to compost (backyard and vermicomposting), soil and decomposition, and what is waste.

Do the Rot Thing: A Teacher's Guide to Compost Activities. San Leandro, Calif.: Alameda County Waste Management Authority and Source Reduction and Recycling Board, 1997.

Contains a variety of activities on composting. Includes activities, such as identifying what is biodegradable, basic composting, compost critters, building a compost pile, and worm composting. Also describes ways for students to teach others about composting. Contains several songs.

Eulo, Anthony. *Worms, Worms, and Even More Worms: A Guide to Vermicomposting*. Sacramento: California Integrated Waste Management Board, 1999.

Contains background information on how to set up a vermicomposting system and provides ideas for many activities that students could do concerning worms.

Nelson, Cindy; Sarah Shaffer; and Cindy Havstad. *Compost! A Teacher's Guide to Activities and Resources in the East Bay*. Oakland: Alameda County Home Composting Education Program, 1991.

Contains a variety of activities on composting.

Audiocassette

Rot 'N Roll by Stan Slaughter. Includes a song called "The Composters."

Includes a colored workbook, a learning guide, two tapes, and two song books. To order write to Heartland All Species Project, 3517 Virginia, Kansas City, MO 64109.

Websites

See "Appendix F–II, Composting websites" and "Appendix F–VI, Vermicomposting websites."

Transparency

MATERIALS TO COMPOST AND NOT TO COMPOST

Do Compost*

- Wood (e.g., sticks)
- Egg shells
- Fallen leaves
- Tea bags
- Coffee grounds and filters
- Paper products
- Grains, beans, breads
- Straw
- Lawn clippings and young weeds
- Fruit and vegetable trimmings

Do Not Compost

- Rocks
- Plastics
- Glass
- Metal products (e.g., aluminum cans)

**Note*: Some materials should not be composted because they might attract rodents; e.g., meat, bones, or fish; dairy products or grease; dog, cat, or bird feces; and diseased plants.

BACKGROUND INFORMATION FOR THE TEACHER

The capacity of landfills is finite, and the costs of maintaining them—economic, social, and environmental—are growing. By weight, 9.3 percent of the solid waste generated in California is food waste and 21.3 percent is yard waste.[1]

In a natural environment, when dead leaves fall to the ground in wooded areas, they are broken down and decomposed over time by a combination of physical (nonliving) and biological (living) factors. Eventually, the elements and compounds which were once part of the living leaves are released into the air and soil where they can be used in the growth of new plants or other organisms.

Contrary to popular belief, items do not decompose rapidly in a landfill. Items buried in a landfill decompose slowly, because the conditions are not ideal for rapid decomposition by decomposers, many of which need oxygen and moisture. Note that some decomposers, such as anaerobic (not needing oxygen) bacteria also decompose garbage in a landfill. Some drier parts of a landfill may be "mummified" for awhile, but as time goes by moisture in the site moves around to different locations and decomposition takes place. What takes five or ten years in a wet landfill to decompose might take 30 to 50 years in a dry landfill site.[2]

Under ideal conditions, with adequate moisture and oxygen, organic materials can decompose rapidly. Organic materials are carbon-based substances that are or were part of living organisms. When organic materials are sent to a landfill, their decomposition is slow. Furthermore, landfill space is used to bury these materials, and nutrients that could be released by decomposers to be used for plant growth are wasted.

On the average, each person in the U.S. generates about 230 pounds of yard waste per year. Food wastes add another 100 pounds per person per year.[3] Kitchen and yard wastes make up approximately one third of household waste. One way to reduce the amount of trash going to landfills is to divert the organic waste and then compost it.

Composting is a way of recycling organic matter, such as food waste, yard waste, manure, and other organic garbage. When this organic matter is combined and exposed to air and water, bacteria, fungi, and other microscopic decomposers efficiently break them down into compost, which is a soil-like material, rich in nutrients (such as carbon and nitrogen). Compost can be used for amending or conditioning soil in gardens, lawns, and house plants.

Compost added to soil not only provides nutrients but also helps to achieve a desirable texture. The texture of compost is usually good for both aeration and moisture retention, because compost is usually granular, allowing water and air to move through it freely. This improves the water holding capacity of soil.

Composting at home or school saves transportation and disposal costs and provides an environmentally sound way to manage organic wastes. Some other benefits of school composting are listed below:[4]

- On-site composting conserves natural resources, saves landfill space, and reduces the need for centralized collection vehicles and off-site handling and processing.
- By learning how to compost, students can develop a greater sense of personal satisfaction through accomplishment, sense of connection to the cycle of life, and sense of personal responsibility for how their behavior and habits can improve their environment.
- Composting teaches students how to use the natural recycling process to help create a soil conditioner that can be used on flower and vegetable gardens.

[1]"Estimated Average 1995 Residential Disposed Waste Stream Composition." California Integrated Waste Management Board.

[2]Written communication from Joe Haworth, Information Officer, County Sanitation Districts of Los Angeles County, October 22, 1998.

[3]*Composting to Reduce the Waste Stream: A Guide to Small Scale Food and Yard Waste Composting*. Ithica, N.Y.: Northeast Regional Agricultural Engineering Service, Cooperative Extension, 1991, p. 1.

[4]Steven Sherman, "Worm Composting Education in Berkeley Schools: A Food Waste Prevention Strategy." Berkeley: Applied Compost Consulting, April, 1996, page 15.

A properly managed compost pile requires five essential ingredients. These are green organic waste, brown organic waste, decomposers, air, and water. Green and wet waste material high in nitrogen (e.g., kitchen scraps, grass cuttings, garden waste) need to be mixed in equal parts with brown and dry waste material that are high in carbon (e.g., dead leaves, straw, shredded paper). In addition, some garden soil is needed to provide a population of decomposers. Because decomposers need air and water, the compost pile should be kept damp (as moist as a wrung-out sponge) and aerated regularly by turning the pile every two weeks.

A list of organic materials that can be placed in a compost bin and those materials that should not is provided on page 489.

For additional information on composting, several books are listed in the "Resources" section at the end of this lesson. Also, see "Appendix C–VI, Organic Materials." In addition, "Appendix D–I, Constructing Wire Mesh Composting Bins" contains directions on how to make three different types of outdoor wire mesh compost bins suitable for school gardens.

Composting and vermicomposting bins at Cesar Chavez Elementary School, San Francisco Unified School District.